Injury Extra (2006) **37**, 38–40

www.elsevier.com/locate/inext

CASE REPORT

Intraoperative development of extensive supratentorial extradural haematoma during evacuation of occipital–suboccipital extradural haematoma

Haruki Yamakawa *, Tetsuya Tanigawara, Toshihiko Nakashima, Tatsuaki Hattori

Department of Neurosurgery, Gifu Prefectural Gifu Hospital, Noishiki-4-6-1, Gifu 500-8717, Japan

Accepted 4 July 2005

Introduction

With the more liberal use of CT scan in the early assessment of head injuries, the incidence of delayed traumatic extradural haematoma (EDH) has been more frequently reported.[1,3,10] Among them, intraoperative development of a contralateral acute extradural haematoma (AEDH) during the evacuation of AEDH has been previously reported but not defined as a distinct clinical entity.[5] It is typically heralded by severe brain displacement during craniotomy, which is manifested by tense dura mater, or if the dura mater has been opened, brain protrusion from the wound.[7,8] We present a unique case of bilateral supratentorial extensive AEDH following decompressive suboccipital craniectomy for evacuation of AEDH, in which a variety of aetiologies might have contributed to the newly formed AEDH.

Case report

A 49-year-old female was admitted to our department, 1 h after she had been injured in a road accident. On admission she was drowsy, amnesic, with no focal weakness; both pupils were equal and reacted to light. Skull X-ray films showed a linear fracture in the left occipital area across the ipsilateral transverse sinus. A CT scan revealed an AEDH on the left side extending above and below the tentorium (Fig. 1A). She was taken to the operation room for evacuation of the haematoma via a left suboccipital craniectomy with occipital craniotomy, during which the cause of the AEDH was revealed to be a laceration of the left lateral sinus wall, underlying an occipital skull fracture. Immediately postoperatively, her left pupil was dilated to 5 mm in diameter without any response to light. CT revealed a massive left frontoparietal AEDH with a severe midline shift (Fig. 1B). The patient was rapidly returned to the operation room, where left frontoparietal craniotomy was performed and left AEDH was successfully removed, but it proved difficult to pull the dura mater up onto the skull by suturing.

* Corresponding author. Tel.: +81 58 246 1111; fax: +81 58 248 3805.
E-mail address: noritake31513@hotmail.com (H. Yamakawa).

1572-3461
doi:10.1016/j.injury.2005.07.003

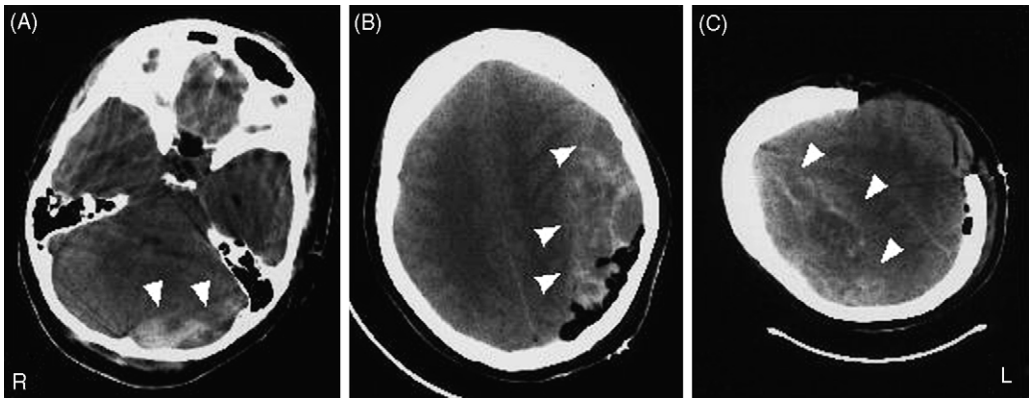

Figure 1 (A) Initial CT scan showing a left occipital and suboccipital extradural haematoma. (B and C) Second CT (B; immediately after the first operation) and third CT (C; immediately after the second operation) scan showing a left and right frontoparietal extradural haematoma with marked mass effect, respectively.

After evacuation, a severe uncontrollable brain protrusion occurred. The scalp was quickly closed without replacement of the bone flap. Immediately after the second evacuation, the right pupil dilated to 5 mm without response to light, and CT revealed a massive right frontoparietal AEDH with marked right-to-left shift (Fig. 1C). The patient was rapidly returned to the operating room, where right frontoparietal craniotomy allowed the complete removal of the AEDH. Neither a bone fracture nor a source of active bleeding was identified at the craniotomy. During the last two craniotomies, she was treated with 75 g of mannitol and increased hyperventilation. Postoperatively, both pupils returned to normal size, and supportive therapy with barbiturate was administrated. She had returned to her previous work and was neurologically normal except for quadrantic hemianopsia 2 months after the accident.

Discussion

The occurrence of an intraoperative development of AEDH contralateral to a craniotomy for evacuation of a primary AEDH is relatively well known to neurosurgeons.[5,7,8] Severe brain bulging during craniotomy is considered the most distinctive feature of this rare entity. If the dura mater has not been opened, it is noted to be extremely tense with no underlying discoloration suggesting subdural haematoma as the cause.

With respect to the formation of the right supratentorial AEDH as in the present case, it could have been the result of the increased intracranial pressure (ICP) caused by the left sided AEDH and the decompression-related brain shift; a reduction of the tamponade effect on the torn dural veins accounts for the development of the controlateral AEDH.[5,9] As reported previously,[1,9] there have been several commonly recognised contributory factors associated with delayed EDH: hyperventilation, osmotic dehydration, surgical decompression and hypertension. Moreover, venous bleeding would be enhanced by mechanical ventilation, as elevated intrathoracic pressure might result in elevated intracerebral venous hypertension.[4] All of these contributory factors were observed in this case. On the other hand, we need to incorporate a different paradigm to explain the phenomenon of the left supratentorial AEDH formation. The fact that we found it difficult to pull the dura mater up onto the skull by suturing at the second operation suggests that the brain had collapsed after suboccipital decompression. As brain shift after external decompression usually presents with a predominantly laterally directed vector, restoring midline and eventually shifting midline contralaterally as observed in the formation of the right AEDH,[2] a less impressive downward shifting causing a vast separation of dura mater from the skull is also present. As Higazi[6] pointed out, the numerous small vessels connecting the outer surface of the dura mater and skull would start to bleed, and a 'vicious circle' would be established with the formation, eventually, of these massive haematoma. That is, the present case supports the notion that brain injury leading to the formation of haematoma should be viewed as a dynamic process rather than a static condition.[8]

Although decompressive suboccipital craniectomy and haematoma evacuation can exacerbate the development of supratentorial AEDH, the surgical strategy is still justifiable considering the physical confinement of its content in the posterior fossa. Consequently, all clinicians involved in the

treatment of head injuries need to be aware that less impressive excessive intracranial hypotension caused by unilateral suboccipital craniectomy may play a crucial role in the development of this rare but serious complication, so long as a preoperative estimation for the inherent rigidity between the dura and the skull cannot be precisely performed in each case.

References

1. Bucci MN, Phillips TW, McGillicuddy JE. Delayed epidural hemorrhage in hypotensive multiple trauma patients. Neurosurgery 1986;19:65—8.
2. Cohen JE, Rajz G, Itshayek E, Umansky F. Bilateral acute epidural hematoma after evacuation of acute subdural hematoma: brain shift and the dynamics of extraaxial collections. Neurol Res 2004;26:763—6.
3. Domenicucci M, Signorini P, Strzelecki J, Delfini R. Delayed post-traumatic epidural hematoma. A review. Neurosurg Rev 1995;18:109—22.
4. Ferrera PC, Mayer DM. Delayed presentation of an epidural hematoma. Am J Emerg Med 1997;15:76—8.
5. Feuerman T, Wackym PA, Gade GF, Lanman T, Becker D. Intraoperative development of contralateral epidural hematoma during evacuation of traumatic extraaxial hematoma. Neurosurgery 1988;23:480—4.
6. Higazi I. Epidural hematoma as complication of ventricular drainage. Report of a case and review of literature. J Neurosurg 1962;28:527—8.
7. Matsuno A, Katayama H, Wada H, Morikawa K, Tanaka K, Tanaka H, et al. Significance of consecutive bilateral surgeries for patients with acute subdural hematoma who develop contralateral acute epi- or subdural hematoma. Surg Neurol 2003;60:23—30.
8. Meguro K, Kobayashi E, Maki Y. Acute brain swelling during evacuation of subdural hematoma caused by delayed contralateral extradural hematoma: report of two cases. Neurosurgery 1987;20:326—8.
9. Poon WS, Rehman SU, Poon CYF, Li AKC. Traumatic extradural hematoma of delayed onset is not a rarity. Neurosurgery 1992;30:681—6.
10. Riesgo P, Piquer J, Botella C, Orozco M, Navarro J, Cabanes J. Delayed extradural hematoma after mild head injury: report of three cases. Surg Neurol 1997;48:226—31.